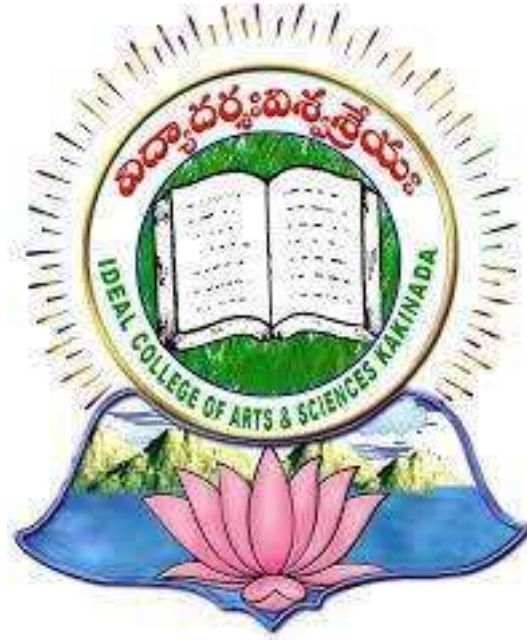


B CA(Data Science)

BOARD OF STUDIES

2023-2024





IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B), Vidyutnagar, Kakinada

Date: 25.08.2023

Board of Studies of BCA(Data Science)

Board of studies meeting for the Department of Computer Science will be held on **26.08.2023** at **02:00PM** in Ideal College of Arts and Sciences (Autonomous), Vidyutnagar, Kakinada, to consider the following Agenda.

You are cordially invited to attend the meeting and make it a success.

Agenda:

1. To ratify the first year, second year and third year syllabus
2. To prepare and ratify scheme of Examinations for both internal and external examinations.
3. To ratify model question papers.
4. To discuss on research, teaching, extension, and other academic activities in the department.
5. To prepare syllabus for certificate courses / Value added courses
6. To have MOU with institutions/organizations/industry/NGO/Corporate office and Pvt.Firms etc.
7. Additional inputs into the curriculum and up gradation of syllabus
8. Introduction of objective type questions and online pattern partially in Internal (Continuous Assessment) Examinations subject to the condition.
9. To approve other academic activities of Department.

T. Subinvar
Principal 25/8/2023
Ideal College of Arts & Sciences (A)
KAKINADA
PRINCIPAL



IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B), Vidyutnagar, Kakinada

RESOLUTIONS

Resolved to follow the following pattern

1. Each paper has 40 marks (40%) of internal (Continuous Assessment) (20+15+5) and 60 marks (60% of external semester- end examination). The minimum pass mark for external examination is 21 marks out of 60 marks in external semester end examination
2. During each semester two internal examinations will be conducted as per schedule for each paper.
3. The average of two internal examination marks conducted by college is considered as internal examination marks.
4. In each semester, the student has to possess a minimum attendance of 75%.
5. Students having attendance between 65% and 75% may be permitted to appear in Semester End/Annual examination on medical grounds only, on payment of Condo nation fee along with medical certificate from Government Medical Officer.
6. If a student is detained due to shortage of attendance i.e., less than 65%, he has to re-join the semester with prior permission from the university. Such students are not eligible to take subsequent semester.
7. However, the student should secure minimum of 40 marks out of 100 marks in internal and external examinations put together.
8. Practical examination will be conducted at the end of every semester of academic year
9. Resolved to approve up gradation in the Syllabus
10. Resolved to approve Certificate courses and value-added courses
11. Implementing ICT enabled pedagogical methods for effective process
12. Resolved to Approve Departmental activities
13. To have MOU with institutions/organizations/industry/NGO/Corporate office and Pvt. Firms etc.
14. Follow the language papers, Life Skill Courses, Skill Development Courses and Core Papers (Math's, & Computer Science) as per Autonomous rules/University norms and APSCHE guide lines and followed BOS done by concerned departments.
15. Resolved to authorize the Chairman, Board of studies to take up all the necessary steps for utilization of the syllabi to be implemented from the academic year 2023-2024 and also authorized to adopt any changes made in the middle of the academic year if any.

* Indicates the marks allotted for student activities like attendance, participation in PPTs, Paper presentation, Seminar, Quiz, Group Discussion and Assignments





K. N. Srinivas

M. Sagarika Siva Rao

Y. S. Srinivas



G. Srinivas





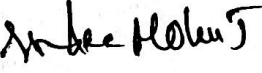

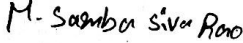





IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B), Vidyutnagar, Kakinada

Board of Studies of BCA (Data Science)

The Board of studies for the Department of Computer Science for the Academic year 2023-2024 is constituted with the following members on 26-8-2023 at 02:00PM with the following members

<u>Sl.No.</u>	<u>Members Present</u>	<u>Signatures of Members</u>
1.	V. Jeevan Kanth Chairman	
2.	Dr. P. Venkateswar Rao University Nominee	
3.	Dr. S Rao Chintalapudi Expert	
4.	Dr. GSN Murthy Expert	
5.	J Ravi Kumar Representative from Industry	
6.	J Surendra Mohan Member	
7.	Y. Sowjanya Member	
8.	M. Samba Siva Rao Student	
9.	K. Meghana Sree Student	

Board of Studies of BCA(Data Science)

The Board of studies for the Department of Computer Science for the Academic year 2023-2024 is constituted with the following members

Sl.No. Members Present

- | | |
|---------------------|----------|
| 1. V. Jeevan Kanth | Chairman |
| 2. J Surendra Mohan | Member |
| 3. Y.Sowjanya | Member |

Student Members Present

- | | |
|----------------------|---------|
| 1. M. Samba Siva Rao | Student |
| 2. K. Meghana Sree | Student |

Adikavi Nannaya University Nominee

1. Dr P. Venkateswar Rao
Associate Professor
Department of Computer Science and Engineering
Adikavi nannaya University
Rajamahendravaram.
Phone No. 9441447037

Members from other Colleges

1. Dr. S Rao Chintalapudi
Professor & HOD
Department of CSE (AI & ML)
CMR Technical Campus
Kandlakoya, Hyderabad
Email ID: hod.aiml@cmrtc.ac.in
Phone Number: 9949379392

2. Dr. GSN Murthy
Head of the Department
Computer Science Engineering,
ADITYA College of Engineering (A)(JNTU K),
Surampalem
Email:murthygsnm@yahoo.com
Phone Number: **9553548444**

Industry/Scientific Organization

1. J Ravi kumar
Managing Director
E Breakers Robotics Research & Technologies
ebreakers.ravikumar@gmail.com
Ph. No: 9030839364

**IDEAL COLLEGE OF ARTS & SCIENCES
(AUTONOMOUS)**

Department of Computer Science & Applications

BACHELOR OF COMPUTER APPLICATIONS– DATA SCIENCE

Under CBCS

Course Structure and Scheme of Examination w.e.f. 2022-23

Semester-I

Paper Code	Course	Teaching Hours	Sem End Exam	Mid Sem Exam	Total Marks	Credits
BCA1.1.1	First Language-English	4	60	40	100	3
BCA1.1.2	Second Language-Telugu	4	60	40	100	3
BCA1.1.3	Life Skill Course: Human Values & Professional Ethics	2	50	---	50	2
BCA1.1.4	Skill Development Course – Electrical Appliances	2	50	---	50	2
BCA1.1.5	Computer Essentials for Data Science	4	60	40	100	4
BCA1.1.6	Computer Essentials for Data Science Lab	2	50	---	50	1
BCA1.1.7	Problem Solving and Programming Using “C”	4	60	40	100	4
BCA1.1.8	Problem Solving and Programming Using “C” Lab	2	50	---	50	1
BCA1.1.9	Numerical and Statistical Methods	4	60	40	100	4
BCA1.1.10	Numerical and Statistical Methods Lab	2	50	---	50	1
Total		30	550	200	750	25

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Department of Computer Science & Applications

**B.C.A. DATA SCIENCE -Semester I
COMPUTER ESSENTIALS FOR DATA SCIENCE**

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
The Computer Essentials module sets out basic ideas and abilities identifying with the utilization of use of devices, computer organization, data representations, databases and data science. Provide abilities to oversee PCs, gadgets, and information safely and viably.		
SYLLABUS		
UNIT I:		(12 hrs)
Digital Fundamentals: Number Systems-Binary, Hexadecimal, Octal, Conversion, Data encoding, Operations on Binary number system, representation of positive and negative integer, compliment operations, real number system, Boolean Algebra, Logic Gates, SOP and POS K map Simple arithmetic circuits, Combinational circuits- Sequential circuits		
UNIT II:		(12 hrs)
Basic Computer Organization: Registers, Instruction Formats, Types of instructions, Execution of a Complete Instruction, Bus Organization, Control Unit Organizations-Hard- wired Control, and Micro programmed Control. Input Out organizations Central processing units and different CPU organizations Subroutines -Memory Memory Hierarchy-Types		
UNIT III:		(8hrs)
Introduction to Database Management Systems-Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL		
UNIT IV:		(10hrs)
Data representation, Data organization, Data models using UML, Types of Data, structured, unstructured, semi structured, examples of real world data, data collection techniques, data interpretation mechanisms. Data storage mechanisms, Hierarchy of storage, Characteristics of storage, Storage media, storage related technologies, online and offline storage mechanisms		
UNIT V:		(8hrs)
Introduction to Data Science - Steps Skills Data Datasets Existing data sources data models, Applications		
Outcomes:		

1. Understand the fundamental concepts of electronic communication and their use in computer applications, the basic structure and operation of a digital computer, identify the logic gates and their functionality, perform Number Conversions from one System to another System, Design basic electronic Circuits (combinational circuits), and understand the Construction of Memory.
2. Understand the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components and understand contemporary microprocessor designs and identify various design techniques employed
3. Understand the role of a database management system in an organization, use of Structured Query Language (SQL) and learn SQL syntax, needs of database processing and learn techniques for controlling the consequences of concurrent data access.
4. Understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, locking and related protocols. Importance of modeling in the software development life, the UML notation and symbols. Identify classes/entities of data, their attributes, and relationships. Design the logical and physical structure of a relational database forefficient data storage
5. Understanding the flow of a data science process, and the skill sets needed to be a data scientist, significance of exploratory data analysis in data science

References:

1. The Unified modelling language Reference Manual, Grady Booch, James Rumbaugh,Ivar Jacobson.
2. Computer Organization Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition,McGraw Hill.
3. Computer Systems Architecture M.Meris Mano, IIIrd Edition, Pearson/PHI

Text Books:

1. J. Glenn Brookshear,"Computer Science: An Overview", Addison-Wesley, Twelfth Edition, 2014.
- 2 Fundamentals of Database Systems, 7th Edition, Ramez Elmasri, U. Shamkant B.Navathe.

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester I

COMPUTER ESSENTIALS FOR DATA SCIENCE LAB

Credits: 1	Lab: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:		
1. To Create a document in Microsoft Word with formatting 2. To Write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number 3. To create a presentation in Microsoft PowerPoint that is interactive and legible content.		
SYLLABUS		
Usage of Word, excel and PowerPoint PC Assembly Data representation and operations on Binary data SQL-Create: Table and column level constraints- Primary key, Foreign key, Null/ Not null, Unique, Default. Check, Alter, Drop, Insert, Update, Delete, Truncate, Select: using WHERE,AND, OR, IN, NOT IN Data collection and interpretation Data storage mechanism and tools		
Outcomes:		
1. Provide hands-on use of Microsoft Office applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills. 2. Understand the functional components of a computer system (processor, storage and input/output) in terms of assembly language commands. Understand the relationship between high level programming languages and machine level implementation. Understand computer architecture and its relationship to higher level machine abstractions. Also able to how to represent integers, real numbers, and character data, representation of negative numbers, storage capacity and its effect on numeric magnitude. Perform arithmetic operations on binary and hexadecimal notations. Convert numbers between decimal, binary and hexadecimal notations. 3. Must be able to construct simple and advanced database queries using Structured Query Language (SQL) 4. Understand the concept Identify Business Requirements. Entity Relationship Data Modeling, Normalization, Advanced Data Modeling Concepts, Transform a Data Model into a Functional Database. Create conceptual models of relational databases based on requirement specification documents 5. Understand the data storage concepts, data storage equipment's that are used to store the user / computer generated data.		

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester I PROBLEM SOLVING AND PROGRAMMING USING “C”

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks
Course Objectives:		
<ol style="list-style-type: none"> 1. Provides knowledge on Algorithms, Flow chart and different programming languages. 2. To train the students with basic concepts of programming using C. 3. Provides complete knowledge of C language. 4. Helps to develop logics which will help them to create program and applications in C. 5. Learning the basic programming constructs, they can easily switch over to any other language in future. 		
SYLLABUS		
UNIT I:		
<p>Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms, Flow Charts, Programming Languages – Generations of Programming Languages</p> <p>Introduction to C: Introduction – Structure of C Program – Writing the first C Program – Files used in C Program – Compiling and Executing C Programs - Programming Example</p>		
UNIT II:		
<p>C Fundamentals: Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Operators in C – I/O Statements (scanf, printf)</p> <p>Decision Control Statements: Introduction to Decision Control Statements – Conditional Branching Statements: simple if, if..else, nested if, switch statements – Programming Examples</p>		
UNIT III:		
<p>Iterative Control Statements: Iterative Statements – Nested Loops – Break and Continue Statement - Goto Statement</p> <p>Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array – one dimensional array for inter-function communication – Two dimensional Arrays – two dimensional arrays for inter-function communication</p> <p>Strings: Introduction – String operations – String functions</p>		
UNIT IV:		
<p>Functions: Introduction – using functions – Function declaration/ prototype – Function definition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive functions.</p> <p>Structure and Unions: Introduction – Nested Structures – Arrays of Structures – Structures and Functions – Unions – Arrays of Unions Variables</p>		
UNIT V:		
<p>Pointers: Introduction to Pointers – declaring Pointer Variables – Passing Arguments to Functions using Pointer – Pointer and Arrays – Dynamic Memory Allocation</p> <p>File Handling: Introduction to Files, File modes, File operations, Reading Data from Files, Writing Data from Files, Detecting the End-of-file</p>		
Outcomes:		
<p>Upon successful completion of this course, students will be able to-</p> <ol style="list-style-type: none"> 1. Understand the basic terminology used in computer programming. 2. Write, compile and debug programs in C language. 3. Use different data types in a computer program. 4. Design programs involving decision structures, loops and functions. 5. Understand the dynamics of memory by the use of pointers and Structures. 6. Apply different operations in File handling. 		

References:		
<ol style="list-style-type: none">1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.2. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.3. Yashavant Kanetkar - Let Us 'C' – BPB Publications.4. Brain W Kernighan and Dennis M Ritchie - The 'C' Programming language - Pearson publications.		
Text Books:		
Computer Fundamentals and Programming in C by Reema Thareja from Oxford University Press		

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester I

PROBLEM SOLVING AND PROGRAMMING USING “C” LAB

Credits: 1	Lab: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:		
1. To implement decision making and arrays. 2. To develop programs for pointers and structures. 3. To write C programs using Files.		
SYLLABUS		
1. Write a C program to calculate the expression: $((a*b)/c)+(a+b-c)$. 2. Write a C program to calculate $(a+b+c)^3$. 3. Write a C program to check whether the given number is Prime or Not. 4. Write a C program to find the sum of individual digits of a given number . 5. Program to convert Hours into seconds. 6. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user. 7. Write a program to check whether given number is Palindrome or Not. 8. Write a C program to check whether a given 3-digit number is Armstrong number or not. 9. Write a C program to print the numbers in triangular form. 1 1 2 1 2 3 1 2 3 4 10. Program to display number of days in given month using Switch – Case. 11. Write a C program to perform the following: i. Addition of two matrices. ii. Multiplication of two matrices. 12. Write a C program to determine if the given string is a palindrome or not. 13. Write C program to find the factorial of a given integer using recursive function. 14. Write a C program to concatenate two strings using pointers. 15. Write a C program to find the length of string using pointers. 16. Program to display Student Details using Structures. 17. Write a C program to iii. Write data into a File. iv. Read data from a File.		
Outcomes:		
After Completion of the course student should able to 1. Student will be able to Know concepts in problem solving. 2. Ability to do programming in C language. 3.To write diversified solutions using C language. 4. ability to write programming with pointers and structures. 5. Ability to write c programming with files.		

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester I

**NUMERICAL AND STATISTICAL
METHODS**

Credits: 4	Theory: 4 HOURS	TUTORIALS: -
Max Marks: 100	External: 60 Marks	Internal: 40
Course Objectives:		
<ol style="list-style-type: none"> To learn how to perform error analysis for arithmetic operations. To demonstrate working of various numerical methods and matrix methods To provide a basic understanding of the derivation and use of methods of interpolation and numerical integration. To impart knowledge of various statistical techniques. To develop students understanding through laboratory activities to solve problems related to above stated concepts. 		
SYLLABUS		
Unit I:		
Numerical Integration, Finite Difference and Interpolation Numerical Integration: 1. Trapezoidal rule 2. Simpson's 1/3 rule 3. Simpson's 3/8 rule Finite Difference and Interpolation: Finite Differences - Forward Differences - Backward differences. Newton's forward interpolation formula - Newton's backward interpolation formula		
Unit II:		
Matrix Algebra Matrix Algebra: Types of matrices -Matrix addition and subtraction - Matrix Multiplication- Transpose of a matrix, row matrix, column matrix, Symmetric and skew symmetric matrices.		
Unit III:		
Linear Equations Ad joint of a square matrix- Inverse of square matrix by using Adj A 3 order only and Rank of a Matrix. Solution of Linear Equations Cramer's Rule Matrix Inverse method Statistical Methods		
Unit IV:		
Basic concepts and definition of statistics: measures of central tendency, Mean, Median and Mode, Standard deviation, coefficient of variation Skewness, Karl pearson's coefficient of skewness, Bowley's Coefficient of skewness,		
Unit V:		
Correlation: Karl Pearson correlation coefficient, Rank correlation and illustrated examples. Probability: Basic concepts and definition of probability, probability axioms, conditional probability, addition and multiplication theorem of probability (Based on set theory concepts), Only Statements, Problems and applications. Note: 1. Concentration on numerical problems only. 2. Proofs of theorems and Derivations of expressions are omitted.		

Outcomes:		
<ol style="list-style-type: none"> 1. Skill to choose and apply appropriate numerical methods to obtain appropriate solutions to difficult mathematical problems. 2. Ability to apply various statistical techniques such as Measures of Central Tendency and Dispersion. 3. Skill to execute programs of various Numerical Methods and Statistical techniques for solving mathematical problems. 4. Ability to find the solution of algebraic and transcendental equations. 5. Familiarize with Newton's backward and forward interpolation formulae. 		
Text Books:		
<ol style="list-style-type: none"> 1. Mathematical Methods by Dr.T.K.V. Iyengar, Dr.B.Krishna Gandhi, Dr. S.Ranganatham, and Dr.M.V.S.S.N. Prasad by S.Chand publications 6th revised edition 2011. 2. Quantitative Techniques by C.Satyadevi by S.Chand Company 		
References:		
<ol style="list-style-type: none"> 1. Higher Engineering Mathematics by Dr.B.S.Grewal by Karna publisher's 34th edition. 2. Statistical Methods – Snedecor G.W. & Cochran W.G. Oxford & + DII. 3. Elements of Statistics – Mode. E.B. - Prentice Hall. 4. Statistical Methods – Dr. S.P. Gupta – Chand & Sons. 		

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester I

NUMERICAL AND STATISTICAL METHODS

Credits: 1	LAB	Lab: 2 Hours	Tutorials: -
Max Marks: 50		External: 50 Marks	Internal:

Course Objectives:		
SYLLABUS		
<ol style="list-style-type: none">1. Problem on Trapezoidal rule.2. Problem on Simpsons 1/3rd rule.3. Problem on Simpsons 3/8rd rule.4. Forward and backward difference Tables.5. Problem on Newton's forwards interpolation formula.6. Problem on Newton's backward interpolation formula.7. Problem on Matrix addition, Subtraction and multiplications.8. Problems on Symmetric and Skew Symmetric Matrices.9. To find adjoint of a square Matrices.10. To find Inverse of a Square Matrices.11. Solution of linear equations by Cramer and Inverse Methods.12. To find Mean, Median and Mode for grouped data.13. To find Standard deviation.14. To find correlation.15. To find rank correlation.		
Outcomes:		
After Completion of the course student should able to		
<ol style="list-style-type: none">1. Student will be able to Know concepts in problem solving.2. Ability to do programming in C language.3. To write diversified solutions using C language.4. ability to write programming with pointers and structures.5. Ability to write c programming with files.		

I YEAR II SEMESTER

Paper Code	Course	Teaching Hours	Sem End Exam	Mid Sem Exam *	Total Marks	Credits
BCA1.2.1	First Language-English-II	4	60	40	100	3
BCA1.2.2	Second Language-Hindi/Sanskrit-II	4	60	40	100	3
BCA1.2.3	Life Skill Course – II	2	50	---	50	2
BCA1.2.4	Life Skill Course – III	2	50	---	50	2
BCA1.2.5	Skill Development Course – II	2	50	---	50	2
BCA1.2.6	Skill Development Course – III	2	50	---	50	2
BCA1.2.7	Data Structures	4	60	40	100	4
BCA1.2.8	Data Structures Lab	2	50	---	50	1
BCA1.2.9	Database Management Systems	4	60	40	100	4
BCA1.2.10	Database Management Systems Lab	2	50	---	50	1
BCA1.2.11	Statistical Methods & their Applications	4	60	40	100	4
BCA1.2.12	Statistical Methods & their Applications Lab	2	50	---	50	1
	Community Internship				100	
Total		34	650	200	950	29

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -

Semester IIDATA

STRUCTURES

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:

1. The objective of the course is to make a student to implement data structures and organize data based on data structures for efficient access.

SYLLABUS

UNIT I:

Introduction to Data Structure: Definition, Data Types, Abstract Data Types (ADT), classification of data structure - primitive & non-primitive data structures, Linear and Non-linear data structures

Arrays: Definition, one dimensional array, two dimensional arrays, Applications, pointers.

Linked List: Definition, linked list ADT, single linked list, double linked list, circular linked list, comparison of linked list with Arrays.

UNIT II:

STACKS: Definition, Stack as an ADT & Operations on stack, Applications of stack, Representation of stack.

QUEUES: Definition, Queue as an ADT & Operations on Queue, Application of Queues, Representation of Queues, Various Queue Structures: circular Queue, DE Queue.

UNIT III:

TREES: Definition, Basic Tree Terminology. **Binary Tree** – Definition, Properties of Binary Trees, Types of Binary Trees, Representation of Binary Tree, Binary Tree Traversals.

Binary Search Tree (BST) – Definition, Operations on a Binary Search Tree, Examples of BST.

UNIT IV:

GRAPHS: Definition, Basic Graph Terminology, Representation of Graphs, Graph Traversal – DFS and BFS. Topological sort, Shortest Path problem, Minimum Spanning Tree.

UNIT V:

SORTING: Definition, Sorting methods - Bubble Sort, Selection Sort, Quick Sort, Insertion Sort, and Merge Sort.

SEARCHING: Definition, searching methods - Linear or Sequential Search, Binary Search.

Outcomes:

1. Identify data structures suitable to solve problems.
2. Developing algorithms.
3. Identifying the use of Time and Space Complexity.
4. Implementing different sorting & searching techniques.

References:

1. Data structures by Lipschutz, McGraw Hill Education
2. Fundamentals of Data Structures in C by Sahni Horowitz, University Press
3. Data Structures and Algorithms by Alfred V Aho and John E Hopcroft and Jeffrey D Ullman, Pearson Education
4. **“Data Structures through C”, Yashavant Kanetkar, BPB Publications**

Text Books:

1. “Classic Data Structures”, by Debasis samantha 2nd edition, phi publications, 2009
2. “Data structures and algorithms”, by Narasimha karumanchi , careermonk publications , 2017

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -

Semester IIDATA

Credits: 1	Lab: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:		
The course is designed to develop skills to design and analyze and implement simple linear and non - linear data structures in java. It strengthens the ability to the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures		
SYLLABUS		
1. Program to generate Fibonacci series using recursion 2. Program for implementation of stack using arrays. 3. Program for implementation stack using linked list. 4. Program for implementation queue using array. 5. Program for implementation queue using linked list. 6. Program for implementation of circular queue. 7. Program for linear searching. 8. Program for binary searching. 9. Program for Binary search tree operations. 10. Program to implement Graph traversal using DFS 11. Program to implement Graph traversal using BFS 12. Program for bubble sort 13. Program for selection sort 14. Program for insertion quick sort 15. Program for merge sort		
Outcomes:		
After completion of course, student will be able to: 1. Implement linked list data structure. 2. Implement various sorting algorithms. 3. Implement various data structure such as stacks, queues, trees, graphs using java-programming language. 4. Implement tree and graph traversals. 5. implement graph traversal algorithms.		

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester II

DATA BASE MANAGEMENT SYSTEM

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
1. The objective of the course is to introduce the design and development of databases for data science with analytical features in relational databases.		
SYLLABUS		
UNIT I:		
Introduction to Database Management System: Introduction to data, information, database, database management systems, file-based system, Drawbacks of file-Based System, Classification of Database Management Systems, advantages and disadvantages of database approach, services of database systems, Components of Database Management System		
UNIT II:		
The Relational Database Model: Various Data Models, Relational Database model, Keys used in Relational model, Relational Data Integrity, Relational set operators, Relationships within the Relational Database, Codd's relational database rules.		
Entity-Relationship Model: Introduction, The components of an ER model, entities, attributes, relationships, Classification of Entity Sets, Attribute Classification, Relationship Degree, Relationship Classification		
UNIT III:		
Introduction to SQL: Structured Query Language (SQL) – Introduction - SQL data types - SQL literals , SQL operators: Arithmetic Operators - Comparison Operators - Logical Operators - Set Operators - Operator Precedence Types of SQL commands: DDL, DML, TCL, DCL Tables: Creating tables – Altering tables – dropping tables – displaying structure of table. Inserting, updating, and deleting: INSERT statement – Bulk inserts of data – UPDATE statement – DELETE statement		
UNIT IV:		
Queries and Subqueries : using SELECT statement Aggregate Functions – Introduction – COUNT(), COUNT(*), SUM(), AVG(), MAX() and MIN() functions. Multiple table processing: Joins and Unions TCL commands: COMMIT, ROLLBACK, and SAVEPOINT statements DCL commands: Privileges and roles – Granting and Revoking privileges and roles GRANT and REVOKE statements.		
UNIT V:		
PL/SQL: Introduction, Structure of PL/SQL program, PL/SQL Data Types, operators used in PL/SQL, variables, declaring variables in PL/SQL, Creating and running a PL/SQL Program, Control Structures: Conditional control statements, Iterative Control statements, Cursors: Types of cursors, Steps to create a Cursor, using cursors in PL/SQL program		

Outcomes:		
<p>Upon successful completion of the course, a student will be able to:</p> <ol style="list-style-type: none"> 1. Gain knowledge of Database, DBMS and SQL. 2. Learn SQL as best analysis tool for extract data in different ways 3. Create a small database using SQL. 4. Able to construct SQL queries to Store, Retrieve data in database 5. Model database using ER Diagrams and design database schemas based on the model. 		
References:		
<ol style="list-style-type: none"> 1. Elimasri / Navathe, Fundamentals of Database Systems, Fifth Edition, Pearson Addison Wesley (2007). 2. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2nd ed., ELSEVIER. 3. SQL: The Ultimate Beginners Guide by Steve Tale. 4. Database System Concepts by Abraham Silberschatz, Henry Korth, and S. Sudarshan, McGrawhill 5. Database Management Systems by Raghu Ramakrishnan, McGrawhill 		
Text Books:		
<ol style="list-style-type: none"> 1. Database management Systems, Alexis Leon and Mathews Leon, Vikas Publications 2002 2. Peter Rob, Carlos Coronel, Database Systems Design, Implementation and Management, Seventh Edition, Thomson (2007) 3. SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross, BPB publications 		

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester II

DATA BASE MANAGEMENT SYSTEM

Credits: 1	LAB	Lab: 2 Hours	Tutorials: -
Max Marks: 50		External: 50 Marks	Internal:

Course Objectives:		
The major objective of this lab is to provide a strong formal foundation in database concepts, technology and practice to the participants to groom them into well-informed database application developers.		
SYLLABUS		
1. Illustrate the creation of a table with constraints		
2. Creation of college database and establish relationships between tables		
3. Employee database		
An enterprise wishes to maintain a database to automate its operations. Enterprise divided into certain departments and each department consists of employees. The following two tables describes the automation schemas		
Dept (deptno, dname, loc)		
Emp (empno, ename, job, mgr, hiredate, sal, comm, deptno)		
Generate the following queries using data of above tables.		
i. List out all employees details		
ii. Display empno, ename, job and sal columns of all employees		
iii. Display employee details who are working as 'CLERK'		
iv. Find out number of employees working in each department		
v. Find out job wise total salaries and number of employees.		
vi. Calculate HRA as 30% and DA as 65% of salary		
4. Demonstrate the use of GRANT and REVOKE commands to provide authorization		
PL/SQL PROGRAMS		
5. Write a PL/SQL program to check the given number is armstrong or not.		
6. Write a PL/SQL program to check the given string is palindrome or not.		
7. Writ a PL/SQL program to generate multiplication tables		
8. Write a PL/SQL code to find the factorial of any number.		
9. Write a PL/SQL program to check the given number is palindrome or not.		
10. Write a PL/SQL program to display to 10 rows in Emp table based on their job and salary.		
11. Write a PL/SQL program to raise the employee salary by 10% for department number 30 people		
12. Write a procedure to update the salary of Employee, who are not getting commission by 10%.		
Outcomes:		
1. Able to apply the basic commands of SQL – DDL, DML.		
2. Able to create the tables at different levels.		
3. Able to create different databases with primary key, foreign keys and insert values for DDL and DML operations.		
4. Able to solve the queries using PL/SQL.		
Able to write procedures.		

IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)**Dept. of Computer Science & Applications****B.C.A. DATA SCIENCE -Semester II****STATISTICAL METHODS & THEIR
APPLICATIONS**

Credits: 4	Theory: 6 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
1. To understand the scope and limitations of statistical methods. 2. To understand the Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties. 3. Apply the Measures of dispersion techniques to find deviations central tendency. 4. Find the differences between Karl Pearson's, Bowley's and Kelly's measures of skewness. 5. To understand the use of linear regression analysis to develop an empirical model of experimental data.		
SYLLABUS		
Unit I:		
Introduction - scope and limitations of statistical methods - classification of data - Tabulation of data - Diagrammatic and graphical representation of data - Graphical determination of percentiles and quartiles.		
Unit II:		
Measures of location: Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties.		
Unit III:		
Measures of dispersion: range, Quartile deviation, mean deviation, standard deviation, combined standard deviation, co-efficient of variation.		
Unit IV:		
Measures of Skewness Karl Pearson's, Bowley's, Kelly's and co-efficient of skewness and kurtosis based on moments.		
Unit V:		
Correlation - Karl Pearson -spearman's rank correlation - concurrent deviation method. Regression Analysis: Simple Regression Equations.		
Outcomes:		
1. Evaluate the probabilities and conditional probabilities. 2. Evaluate expectations and conditional expectations of random variables. 3. Approximate the distribution of sum of random variables using CLT. 4. Construct point estimators using the method of maximum likelihood. 5. Calculate the number of samples needed to construct confidence levels on the mean and variance of a normal distribution.		
Reference Books:		
1. Fundamental of mathematical Statistics - S.C.Gupta&V.K.Kapoor- Sultan Chand 2. Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII 3. Elements of statistics - Mode. E.B. -Prentice Hall 4. Statistical Methods - Dr.S.PGupta - Sultan chand& sons.		



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IDEAL COLLEGE OF ARTS & SCIENCES (AUTONOMOUS)

Dept. of Computer Science & Applications

B.C.A. DATA SCIENCE -Semester II

STATISTICAL METHODS & THEIR
APPLICATIONS LAB

Credits: 1	Lab: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives: This lab course will provide opportunity to the learners to implement the concepts and techniques learned in Statistical Techniques course in C/C++ Language and/or in MS-Excel

SYLLABUS

Session 1 : Frequency distribution, central tendency and dispersion
Session 2: Hypothesis testing, t distribution, chi square distribution, f distribution, normal distribution
Session 3 : Regression and correlation coefficient-univariate, multivariate
Session 4 : Anova test
Session 5 : Central charts
Session 6 : Time series
Session 7 : Sampling for a problem domain and analyze –Case Study

Outcomes:

1. Skill to choose and apply appropriate statistical methods to obtain appropriate solutions to difficult mathematical problems.
2. Ability to apply various statistical techniques such as Measures of Central Tendency and Dispersion.
3. Skill to execute programs of various Statistical techniques for solving mathematical problems. Familiarize with various types of charts.



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Course Structure and Scheme of Examination w.e.f. 2022-23

III Semester

Paper Code	Course	Teaching Hours	Sem End Exam	Mid Sem Exam *	Total Marks	Credits
BCA2.1.1	First Language: English	4	60	40	100	3
BCA2.1.2	Second Language: Telugu	4	60	40	100	3
BCA2.1.3	Life Skill Course: Environmental Education	2	50	0	50	2
BCA2.1.4	Skill Development Course: Digital Marketing	2	50	0	50	2
BCA2.1.5	Object Oriented Programming Through Java	4	60	40	100	4
BCA2.1.6	Object Oriented Programming Through Java Lab	2	50	0	50	1
BCA2.1.7	Operating Systems	4	60	40	100	4
BCA2.1.8	Operating Systems Lab	2	50	0	50	1
BCA2.1.9	Advanced Excel	4	60	40	100	4
BCA2.1.10	Advanced Excel Lab	2	50	0	50	1
Total		30	550	200	750	25



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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.C.A. DATA SCIENCE -Semester III
OBJECT ORIENTED PROGRAMMING THROUGH JAVA**

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 75 Marks	Internal: 25 Marks

Course Objectives:		
1. Object Oriented Programming (OOP) has become the predominant technique for writing software in the past decade. Many other important software development techniques are based upon the fundamental ideas captured by object-oriented programming.		
SYLLABUS		
UNIT I:		
Fundamentals of OOP : Introduction, Object Oriented paradigm, Basic Concepts of OOP Overview of Java Language: Introduction, Java features, Java program structure, Java tokens, Implementing a Java Program, Java Virtual Machine (JVM), Command line arguments. Constants, Variables & Data Types: Introduction, Constants, Data Types, Variables, Declaration of Variables, Giving Value to Variables, Scope of variables, Type casting, operators		
UNIT II:		
Input and Output in Java: Reading Input with Java.util.Scanner Class, Displaying Output with System.out.println(), Control Statements in Java: Conditional control statements, Iterative control statements, break Statement, continue Statement, return Statement, Classes, Objects & Methods: Introduction, Defining a class, Adding methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members		
UNIT III:		
Arrays, Strings: Arrays, One-dimensional arrays, Creating an array, Two – dimensional arrays, Strings, Wrapper classes, Inheritance: Introduction, Types of inheritance, Overriding methods, Final variables and methods, Final classes, Abstract methods and classes		
UNIT IV:		
Interfaces: Defining interfaces, Extending interfaces, Implementing interfaces, Accessing interface variables, Multiple Inheritance using interfaces, Exceptions: Types of errors: Compile-time errors, Run-time errors, Exceptions, Exception handling, Multiple Catch Statements		
UNIT V:		
Multithreaded Programming: Introduction, Lifecycle of a Thread, Creating Threads, Extending the Threads, Stopping and Blocking a Thread, Applet Programming: Definition, Local and remote applets, Applet Life cycle: Initialization state, Running state, Idle or stopped state, Dead state, Display state, Building Applet code, Packages: Introduction, Java API Packages, Creating Packages, Accessing a Package		
Outcomes:		
The student would become competent enough to write, debug, and document well-structured java applications		



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1. Understand the concept and underlying principles of Object-Oriented Programming
2. Understand how object-oriented concepts are incorporated into the Java programming language
3. Develop problem-solving and programming skills using OOP concept
4. Understand the benefits of a well-structured program
5. Develop the ability to solve real-world problems through software development in high-level programming language like Java
6. Develop efficient Java applets and applications using OOP concept

Text Books:

1. E. Balaguruswamy, Programming with JAVA, A primer 3e, TATA McGraw-Hill Company

References:

1. Programming in Java by Sachin Malhotra, OXFORD University Press
2. Core Java: An Integrated Approach, Authored by Dr. R. Nageswara Rao & Kogent Learning Solutions Inc.
3. John R. Hubbard, Programming with Java, Second Edition, Schaum's outline Series, TATA McGraw-Hill Company.
4. Deitel & Deitel. Java TM: How to Program, PHI (2007)
5. Java Programming: From Problem Analysis to Program Design- D.S Mallik
6. Object Oriented Programming Through Java by P. Radha Krishna, Universities Press (2008)



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Department of Computer Applications

B.C.A. DATA SCIENCE -Semester III

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Credits: 1	Theory: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:

1. To build software development skills using java programming for real world applications.
2. To implement object-oriented concepts of java.
3. To implement classical problems using java programming.

SYLLABUS

1. WAP to find whether a number is prime or not
2. WAP to demonstrate the factorial of a number.
3. WAP to display a number is even or odd
4. WAP to find a sub string in the given string.
5. WAP to arrange the given strings in Alphabetic Order.
6. WAP to search an element using arrays
7. WAP to implement Addition and multiplication of two Matrices.
8. WAP to demonstrate the use of Constructor.
9. WAP to demonstrate the use of overriding Method.
10. WAP for single Inheritance.
11. WAP for implementing Interface.
12. WAP on Multiple Inheritance.
13. WAP for to implement Thread
14. WAP to demonstrate Exception handling.
15. WAP to demonstrate Applet program.

Outcomes:

1. Student can write programs using concepts of OOP.
 2. Able to write programs on method overloading and overriding techniques.
 3. Able to implement programs by reusing the properties of existing classes.
 4. Acquire knowledge on how to handle multiple requests and process them using multithreading.
- Able to write client-side application development using applets.



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B.C.A. DATA SCIENCE -Semester III

OPERATING SYSTEMS

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
<ol style="list-style-type: none"> 1 To know the basic Structure, Components and Organization of Operating System. 2 To learn the notation of a Process-a Program in Execution, Management, Scheduling and Classic Problems of Synchronization. 3 To gain knowledge in various Memory Management Techniques. 4 To understand Various File operations. 		
SYLLABUS		
UNIT I:		
Operating System Introduction: Operating Systems Objectives and functions, Computer System Architecture, OS Structure, Evolution of Operating Systems (Simple Batch, Multi programmed, Distributed Systems, Real-Time Systems), Operating System services, System Calls, Types of System Calls		
UNIT II:		
Process and CPU Scheduling - Process concepts - The Process, Process State, Process Control Block, Process Scheduling - Schedulers, Non-Preemptive (FCFS, SJF) and preemptive Scheduling algorithms (RR), Threads: Definition, uses of threads, types of threads		
UNIT III:		
File System Interface – Files: Introduction to files, File types, basic operations on files, file attributes, File Access methods, File Sharing, Protection, File System Structure, Directories: Introduction to directories, Directory Structure, Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Attachment		
UNIT IV:		
Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks: Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.		
UNIT V:		
Memory Management and Virtual Memory - Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table. Segmentation, Segmentation with Paging		



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Outcomes:		
The students will be able to: <ol style="list-style-type: none">1. Understand the main components and Structure of Operating System & their functions.2. Analyze various ways of Process Management & CPU Scheduling Algorithms.3. Evaluate various device and resources like Memory, Time and CPU Management techniques in distributed systems.4. Apply different methods for Preventing Deadlocks in a Computer System.		
Text Books:		
<ol style="list-style-type: none">1. Operating system Concepts: Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 8th Edition, Wiley.2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.		
References:		
<ol style="list-style-type: none">1. Principles of Operating Systems by Naresh Chauhan, OXFORD University Press2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.3. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.		



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B.C.A. DATA SCIENCE -Semester III

OPERATING SYSTEMS LAB

Credits: 1	Theory: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:

1. To familiarize the students with the Architecture of UNIX Operating System.
2. To learn the mechanisms of CPU Scheduling and Deadlock Detection algorithms.
3. To learn mechanisms of Processes synchronization using semaphores.

SYLLABUS

1. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
2. Developing applications using Inter Process Communication (using shared memory)
3. Implement any two memory management schemes
4. Implement file allocation techniques (Linked)
5. Implement Deadlock prevention algorithm.
6. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Round robin. Compute and print the average waiting time and average turnaround time.
7. Implement file allocation techniques (Indexed)
8. Implement file allocation techniques (Contiguous)
9. Developing applications using Inter Process Communication (pipes)
10. Developing applications using Inter Process Communication (message queues)
11. Implement Deadlock detection algorithm.
12. Implement Deadlock avoidance algorithm.

Outcomes:

1. Students are able to differentiate difference between MS-DOS, Windows and UNIX OS.
2. Students are able to write programming by using system calls (read, write, fclose, fork, perror, pipe, sysconf) using vi editor.
3. Learn the role of CPU Scheduling algorithms and memory management using page replacement algorithms.
4. Students are familiar with basic UNIX commands.
5. Be familiar with shell programming and shell commands.



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B.C.A-DS-Semester III

ADVANCE EXCEL

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
<p>1. To discuss about use a range of lookup and reference functions.</p> <p>2. To understand protect data in worksheets and workbooks and create summaries in your spreadsheets using subtotals.</p> <p>3. To explain the concepts of construct and operate PivotTables using some of the more advanced techniques and create and edit a PivotChart.</p> <p>4. To understand use goal seeking to determine the values required to reach a desired result group cells and use outlines to manipulate the worksheet.</p>		
SYLLABUS		
UNIT I:		9 Classes
Excel Introduction- An overview of the screen, navigation, and basic spreadsheet concepts- Various selection techniques- Shortcut Keys. -Using Basic Functions- Using Functions – SUM, AVERAGE, MAX, MIN, COUNT, COUNTA- ABSOLUTE, MIXED AND RELATIVE Referencing.		
UNIT II:		9 Classes
Mathematical Functions- SumIf, SumIfs CountIf, CountIfs AverageIf, AverageIfs, Nested IF, IFERROR Statement, AND, OR, NOT. Date and Time Functions- Today, Now- Day, Month, Year- Date, Date if, DateAdd- EOMonth, Weekday. Advanced Paste Special Techniques- Paste Formulas, Paste Formats- Paste Validations- Transpose Tables.		
UNIT III:		11 Classes
Advance Excel Analysis - Goal Seek- Scenario Analysis- Data Tables (PMT Function)- Solver Tool- Data Validation- Number, Date & Time Validation- Text and List Validation- Custom validations based on the formula for a cell- Dynamic Dropdown List Creation using Data Validation – Dependency List.		
UNIT IV:		10 Classes
Lookup Functions- Vlookup / HLookup- Index and Match- Creating Smooth User Interface Using Lookup- Nested VLookup- Reverse Lookup using Choose Function- Worksheet linking using Indirect- Vlookup with Helper Column- Pivot Tables- Creating Simple Pivot Tables- Basic and Advanced Value Field Setting- Classic Pivot table- Choosing Field- Filtering PivotTables- Modifying PivotTable Data.		
UNIT V:		11 Classes
Charts and slicers - Various Charts i.e. Bar Charts / Pie Charts / Line Charts - Using SLICERS, Filter data with Slicers - Manage Primary and Secondary Axis - Excel Dashboard- Planning a Dashboard- Adding Tables and Charts to Dashboard - Adding Dynamic Contents to Dashboard.		
Outcomes:		



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1. Use advanced functions and productivity tools to assist in developing worksheets
2. Manipulate data lists using Outline, Autofilter and PivotTables
3. Use Consolidation to summarise and report results from multiple worksheets
4. Record repetitive tasks by creating Macros
5. Use Hyperlinks to move around worksheets.

Text Books:

1. Step by Step Microsoft Excel 2010 by Curtis D.Frye.

References:

1. <https://support.microsoft.com/en-us/office/formulas-and-functions-294d9486-b332-48ed-b489-abe7d0f9eda9#ID0EBBD=Formulas>



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**B.C.A-DS-Semester III
ADVANCE EXCEL LAB**

Credits: 1.5	Lab: 3 Hours	Tutorials: -
Max Marks: 100	External: 50 Marks	Internal: 50 Marks
Course Objectives:		
<ol style="list-style-type: none"> 1. To discuss about use a range of lookup and reference functions. 2. To understand protect data in worksheets and workbooks and create summaries in your spreadsheets using subtotals. 3. To explain the concepts of construct and operate PivotTables using some of the more advanced techniques and create and edit a PivotChart. 4. To understand use goal seeking to determine the values required to reach a desired result <ul style="list-style-type: none"> • group cells and use outlines to manipulate the worksheet. 		
SYLLABUS		
Lab 1: Calculations with Data Sets Basic Arithmetic Other Mathematical Operations		
Lab 2: Date and Time Functions		
Lab 3: Create an excel sheet to show time table of your class		
Lab 4: Create a pay slip with details of employee salary		
Lab 5: Create an excel sheet for student results and grades calculation		
Lab 6: Prepare an excel sheet for creating a pie chart for budget analysis		
Lab 7: Create a new worksheet with a list of possible month choices. Give the block of cells a range name. Apply validation to cell B2 so that when you click on the cell you see and input message telling you what you can do Extend the validation so that when a user chooses a month that doesn't exist, they see this message.		
Lab 8: Create an If function to calculate a bonus for each player based on the following criteria: <ul style="list-style-type: none"> • If a players Goals Scored meets or exceeds his Goals Target he receives a bonus equal to £1000 for each goal he has scored • Otherwise he receives an encouraging message • Copy the formula down and check that it works 		
Lab 9 : Create a chart to compare the favourite films data for 15-25 year olds only (be careful not to include any unnecessary blanks rows or columns in your selected data).Format this chart so that it is a		



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pie chart, with the Barbarella slice "exploded" and each segment labelled.

Lab 10 : Create a work sheet for “Reported Road Accidents Involving Animals”. Insert some sparklines in column F to create tiny charts of the accident data in columns B:E.
Use the sparkline tools Design tab to edit the sparklines. Change the accident figure for deer in 2010 to just 100 to see the effect it has on the sparklines.

Outcomes:

- Master Microsoft Excel and many of its advanced features
- Become one of the top Excel users in your team
- Carry out regular tasks faster than ever before
- Acquire financial modeling skills
- Create models with multiple scenarios
- Design professional and good-looking advanced charts
- Become a proficient user able to work with Excel functions, pivot tables, visualizations, and advanced features.



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IV- SEMESTER

Paper Code	Course	Teaching Hours	Sem End Exam	Mid Sem Exam *	Total Marks	Credits
BCA2.2.1	Tableue	4	60	40	100	4
BCA2.2.2	Tableue Lab	2	50	---	50	1
BCA2.2.3	Data Mining and Data ware Housing	4	60	40	100	4
BCA2.2.4	Data Mining and Data ware Housing Lab	2	50	---	50	1
BCA2.2.5	Web Programming	4	60	40	100	4
BCA2.2.6	Web Programming Lab	2	50	---	50	1
BCA2.2.7	Design and Analysis of Algorithms	4	60	40	100	4
BCA2.2.8	Design and Analysis of Algorithms Lab	2	50	---	50	1
BCA2.2.9	Introduction to Data Science with R-Programming	4	60	40	100	4
BCA2.2.10	Introduction to Data Science with R-Programming Lab	2	50	---	50	1
BCA2.2.11	Object Oriented software Engineering	4	60	40	100	4
BCA2.2.12	Object Oriented software Engineering Lab	2	50	---	50	1
	Short Term Internship				100	
Total		36	660	240	1000	30



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B.C.A. DATA SCIENCE -Semester IV

TABLUE

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
<ol style="list-style-type: none"> 1. In this course, you will be introduced to the field of data visualization and the various tools Tableau Public offers to get familiarized with Transmission media. 2. You will learn to identify datasets to connect to, explore, analyze, filter and structure your data to create your desired visualizations. 		
SYLLABUS		
UNIT I		
INTRODUCTION to TABLEAU: History and Overview of Tablue, Architecture, features of Tablue, Data Visualization, Environment setup, File Types & Extensions, Tools of Tablue TABLEAU PRODUCTS: Desktop, Server ,Publisher, Public, Reader, Creating Your First visualization: Getting started with Tableau Software, Installation of Tableau Desktop/Public, Data Terminology, Data file formats, design flow, file types, data types.		
UNIT II		
Data visualization: Data visualization using Tableau feature “show me”, Connecting your Data to Tableau. Formatting Visualizations: Formatting Tools and Menus, Formatting specific parts of the view, Editing and Formatting Axes.		
UNIT III		
Tableau Calculations: Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields, Functions, Operators, Applying new data calculations to your visualization Tableau Data Sources: Text file, Microsoft Excel, Custom data view, Extracting data, fields operations, Data joining, Data blending.		
UNIT IV		
Manipulating Data in Tableau: Cleaning-up the data with the Data Interpreter, Structuring your data, Sorting and filtering Tableau data. Organizing and Simplifying data: Applying Filters, context Filters, condition Filters, Quick Filters, Sorting of Data		
UNIT V		
Distributing & Publishing Your Visualization: Tableau file types, Publishing to Tableau Online, Sharing your visualization. Basic Data Visualization Graph: Pivot table and Heat Map, Highlight Table, Bar Chart, Line Chart, Area Chart, Grant Chart, Histogram		



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Outcomes:		
1. What is data 2. Where to find data 3. Foundations for building Data Visualizations		
Text Book:		
1. Tableau 10 for Beginners: Step by Step guide to developing visualizations in Tableau by Chandraish Sinh		
References:		
1. Learning Tableau 2020: Create effective data visualizations, build interactive visual analytics, and transform your organization, 4th Edition by Joshua N. milligan 2. The Tableau Workshop: A practical guide to the art of data visualization with Tableau by Sumit Gupta		



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B.C.A. DATA SCIENCE -Semester IV

TABLUE LAB

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
<ol style="list-style-type: none"> 1. In this course, you will be introduced to the field of data visualization and the various tools Tableau Public offers to get familiarized with Transmission media. 2. You will learn to identify datasets to connect to, explore, analyze, filter and structure your data to create your desired visualizations. 		
SYLLABUS		
Week 1: Tablue software download and install		
<ol style="list-style-type: none"> i) Tablue vs Excel ii) Power of Data Visualization and Components of Tableau 		
Week 2: i) Import excel data in tablue and data formatting in column, view data and sort data		
ii) format work sheets in tablue		
Week 3: create text tables in tablue and table calculations in tablue		
Week 4: number functions and string functions in tablue		
Week 5: Data Preparation		
Connecting to different Data Source i). Excel ii). CSV iii). SQL Serve		
Week 6: Live vs Extract Connection		
<ol style="list-style-type: none"> i) Creating Extract ii) Refreshing Extract iii) Increment Extract iv) Refreshing Live v) Data Source Editor 		
Week 7: Functions in Tableau Join, Union, Sort, Set, forecasting, Highlighting, Device Designer		
Week 8: create Charts and Dashboard in tablue		
Bar Chart, Pareto Chart, Bullet Chart, Text Chart, Heat Map, Waterfall Chart, Gantt Chart, Pie Chart Scatter Plot		
Outcomes:		



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1. Understanding What is data
2. Understanding Where to find data
3. Foundations for building Data Visualizations



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B.C.A. DATA SCIENCE -Semester IV

DATA MINING AND DATA WARE HOUSING

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:

1. Be familiar with mathematical foundations of data mining tools.
2. Understand and implement classical models and algorithms in data warehouses and data mining
3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4. Master data mining techniques in various applications like social, scientific and environmental context. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

SYLLABUS

UNIT I:

Introduction: What Motivated Data Mining? Why Is It Important?, So, What Is Data Mining? , Data Mining—On What Kind of Data?: Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Data Preprocessing: Why Preprocess the Data?, Descriptive Data Summarization: Measuring the Central Tendency, Measuring the Dispersion of Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

UNIT II:

Data Warehouse and OLAP Technology: An Overview , What Is a Data Warehouse? , A Multidimensional Data Model, From Tables and Spreadsheets to Data Cubes, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional databases, Examples for Defining Star, Snowflake and Fact Constellation Schemas, Data Warehouse Architecture: Steps for the Design and Construction of Data Warehouses,

UNIT III:

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Efficient and Scalable Frequent Item set Mining Methods: The Apriori Algorithm: Finding Frequent Item sets Using Candidate Generation, Generating Association Rules from Frequent Item sets.

UNIT IV:

Classification and Prediction: What Is Classification? What Is Prediction? , Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Decision Tree Induction, Attribute Selection Measures. Rule-Based Classification: Using IF-THEN Rules for Classification

UNIT V:



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Cluster Analysis: What is Cluster Analysis?, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods. Hierarchical Methods: Agglomerative and Divisive Hierarchical Clustering.

Outcomes:

At the end of the course, the student will demonstrate the following. The students will be able to:

1. Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. Apply preprocessing statistical methods for any given raw data
3. Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes
4. Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques
5. Select and apply proper data mining algorithms to build analytical applications.
6. Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate the knowledge discovery.

Text Books:

1. Data Mining: Concepts and Techniques Second Edition Jiawei Han University of Illinois at Urbana-Champaign Micheline Kamber
2. Data Warehousing by Reema Thareja, Oxford University Press

References:

1. Data Mining by Vikram Pudi, P. Radha Krishna, Oxford Universal Press
2. J. Han, M. Kamber and J. Pei, Data Mining: Concepts and Techniques, 3rd.Edition Morgan Kaufmann, 2011
3. Introduction to data mining –G. K. Gupta, PHI
4. Data mining, Data warehouse &Olap-Berson, Tata McGraw Hill



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B.C.A. DATA SCIENCE -Semester IV

DATA MINING AND DATA WARE HOUSING LAB

Credits: 1	Theory: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:

1. Be familiar with mathematical foundations of data mining tools.
2. Understand and implement classical models and algorithms in data warehouses and data mining
3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4. Master data mining techniques in various applications like social, scientific and environmental context. Develop skill in selecting the appropriate data mining algorithm for solving practical problems

SYLLABUS

1. Demonstration of preprocessing on dataset student.arff.
2. Demonstration of preprocessing on dataset labor.arff.
3. Demonstration of Association rule process on dataset contactlenses.arff using Apriori algorithm.
4. Demonstration of Association rule process on dataset test.arff using Apriori algorithm.
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm.
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm.
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm.
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm.
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means.
10. Demonstration of clustering rule process on dataset student.arff using simple k-means..

Outcomes:

1. Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. Apply preprocessing statistical methods for any given raw data
3. Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes



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B.C.A. DATA SCIENCE -Semester IV

WEB PROGRAMMING

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
<ol style="list-style-type: none"> 1. To provide knowledge on web architecture, web services, client side and server side scripting technologies to focus on the development of web-based information systems and web services. 2. To provide skills to design interactive and dynamic web sites. 		
SYLLABUS		
UNIT I:		
Introduction to Internet: Definition of Internet – History of Internet – Advantages & disadvantages of Internet – Tools of internet - How internet works. Introduction to WWW: Definition of WWW – WWW tools - Web Terminology – web browser – web server, E-Mail : Definition of e-mail – advantages & disadvantages of e-mail, message components		
UNIT II:		
Introduction to HTML: Basic HTML – HTML document structure – HTML tags – Basefont tag – title tag – body tag – Horizontal Rule Tag - Text formatting tags – Character tags - Character entities, HTML Lists : Ordered List , Unordered List & Definition List – Using colors – Using Images, Hyperlinks: Textual links, Graphical links, types of document links, anchor tag		
UNIT III:		
HTML Tables – table creations tags, Nested Tables, Frames: Frame introduction - frame creation tags – Nested Frames – Forms: Form Controls : textbox, button, password, checkbox, radio button, select, text area - Processing of forms		
UNIT IV:		
Introduction to Scripting: JavaScript Introduction - Simple Program - Obtaining User Inputs with Prompt Dialogs - variables – operators (arithmetic, relational, logical, increment and decrement). JavaScript – Control Statements: Introduction – conditional control statements (if, if...else, switch) – Repetitive statements (for, while, do...while) - break and continue Statements		
UNIT V:		
JavaScript Functions: Introduction - Program Modules in JavaScript - Programmer-Defined Functions - Function Definitions - Scope Rules - JavaScript Global Functions, Advanced HTML : Cascading Style Sheets (CSS): Introduction – Using Styles: As an attribute, tag & external file – Defining Your own styles – Properties and values : properties related to Fonts, Backgrounds & colors, text , boxes & borders		
Outcomes:		



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1. To understand the web architecture and web services.
2. To practice latest web technologies and tools by conducting experiments.
3. To design interactive web pages using HTML and Style sheets.
4. To study the framework and building blocks of Integrated Development Environment.
5. To provide solutions by identifying and formulating IT related problems.

Text Books:

1. Chris Bates, Web Programming Building Internet Applications, Second Edition, Wiley.
2. Deitel & Deitel , Goldberg “Internet and world wide web – How to program”, pearson educations Asia

References:

1. Paul S.Wang Sanda S. Katila, An Introduction to Web Design Plus Programming, Thomson.
2. Robert W.Sebesta, Programming the World Wide Web, Third Edition, Pearson Education.
3. Joel Sklar, Principles of Web Design, Thomson.
4. Raj Kamal, Internet and Web Technologies, Tata McGraw Hill.
5. Gopalan & Akilandeswari, Web Technology: A Developer’s Perspective, PHI.



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B.C.A. DATA SCIENCE -Semester IV

WEB PROGRAMMING LAB

Credits: 1	Theory: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:

1. To design and implement websites with good aesthetic sense of designing.
2. To learn how XML and its related technologies function

SYLLABUS

1. Create a simple HTML page which demonstrates all types of lists.
2. Create a letter head of your college using following styles
 - i. image as background
 - ii. use header tags to format college name and address
3. Create a web page, which contains hyper links like fruits, flowers, animals. When you click on hyper links, it must take you to related web page; these web pages must contain with related images.
4. Create a hyperlink to move around within a single page rather than to load another page.
5. Create a leave letter using different text formatting tags.
6. Create a table format given bellow using row span and colspan.

RNO	NAME	MARKS				
		M1	M2	M3	M4	M5

Insert 5 records.

7. Create a table with different formats as given bellow.
 - i. Give different background and font colors to table header, footer and body.
 - ii. Use table caption tag.
8. Write java script to find factorial of a number
9. Write java script to find sum of digits of a number
10. Write java script to display student details in a web page
11. Create a student Bio-Data, using forms.
12. Create a web page using following style sheets
 - i. Inline style sheets.
 - ii. Embedded style sheets.



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iii. External style sheets		
Outcomes:		
<ol style="list-style-type: none">1. Students can able to understand lists, its types, header tags and image as background.2. Students can able to create hyperlinks and the web page contains images. They can also use different types of tags.3. Students can able to create tables using row span and column span. They can also divide a web page both horizontally and vertically.4. Students can create their bio-data using forms. They can also create a web page using cascading styles.5. Students are able to write java script programs by accepting values and can apply mathematical operations.		



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B.C.A. DATA SCIENCE -Semester IV

DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 4	Theory: 5 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
<ol style="list-style-type: none"> 1. To learn mathematical background for analysis of algorithm. 2. To study various Divide and Conquer Methods. 3. To understand the differentiation between Greedy and Dynamic Algorithms. 4. To identify the solutions of difficulty and overlapping problems using dynamic programming. 5. To Explain and Implementation of backtracking Procedure and randomized algorithms. 		
SYLLABUS		
Unit I:		
A simple example of design using insertion sort, pseudo code for insertion sort and analysis of time complexity. Performance Analysis - Space complexity and Time complexity (posterior testing, and a priori approach), Asymptotic Notations (O , Ω , Θ). Average, Best- and Worst-case complexity.		
Unit II:		
Introduction to Divide and Conquer Algorithms - Finding the Maximum and Minimum, Quick sort (Derivation of Average case analysis and Worst-case analysis), Binary Search (Derivation of Average case analysis), and Strassen's Matrix Multiplication.		
Unit III:		
Introduction to Greedy Algorithms - Fractional Knapsack problem, minimum cost spanning trees, Kruskal's and Prim's Algorithms, Optimal Merge patterns and Single-Source Shortest Paths		
Unit IV:		
Definition - All-pairs shortest paths, Traveling salesman problem, optimal parameterization for product of sequence of matrices and multistage graphs		
Unit V:		
Introduction- definition of backtracking, examples, 4-Queens, Sum of Subsets, Random Number Generators and Primality Testing using randomized algorithms.		
Outcomes:		
<ol style="list-style-type: none"> 1. Ability to understand the basic Characteristics of algorithms to calculate the efficiency of algorithms. 2. Attain the importance of Divide and Conquer algorithms 3. Learn the concepts of Greedy algorithms. 4. Gain the knowledge in Dynamic programming. 5. Understand the Back tracking and randomized algorithms. 		
Text Book:		



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1. Horowitz, Sahni, Rajasekaran, Fundamentals of Computer Algorithms, Universities Press Pvt Ltd, 2008.

References:

1. Donald E. Knuth, *The Art of Computer Programming Volume 3, Sorting and Searching*, 2nd Edition, Pearson Education, Addison-Wesley, 1997.
2. GAV PAI, *Data structures and Algorithms*, Tata McGraw Hill, Jan 2008. At the end of this course,

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B.C.A. DATA SCIENCE -Semester IV

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Credits: 1	Theory: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering knowledge**).
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching, substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences (**Problem analysis**).
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations (**Design/development of solutions**).

SYLLABUS

WEEK1 : Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

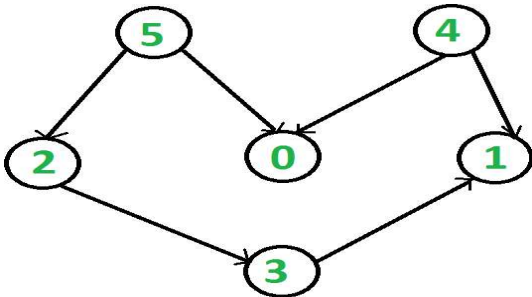
WEEK2 : Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.



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WEEK3:

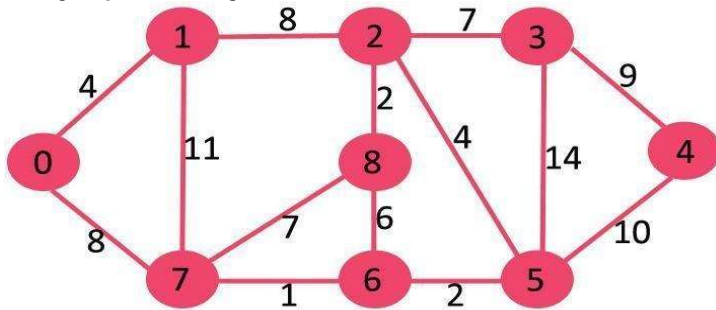
a. Obtain the Topological ordering of vertices in a given digraph.



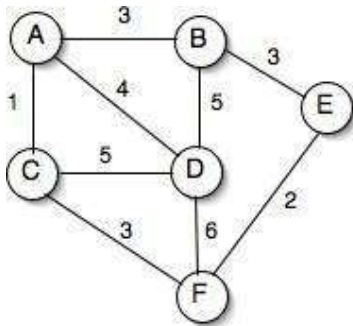
Compute the transitive closure of a given directed graph using Warshall's algorithm.

WEEK4: Implement 0/1 Knapsack problem using Dynamic Programming.

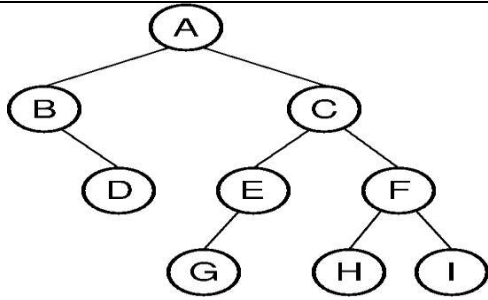
WEEK5: From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm



WEEK6: Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.



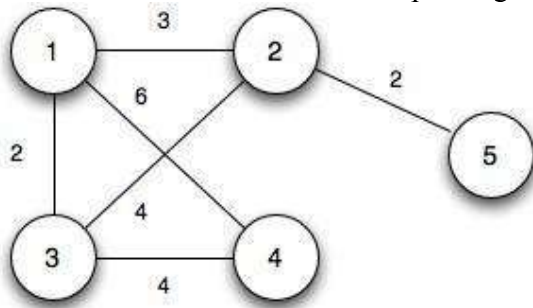
WEEK 7: Perform various tree traversal algorithms for a given tree.



WEEK 8: Find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. A suitable message is to be displayed if the given problem instance doesn't have a solution.

WEEK 9: Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

WEEK-10: Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.



Outcomes:

1. **Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity
2. **Problem-Solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.



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Department of Computer Applications

B.C.A Data Science-Semester IV

**INTRODUCTION TO DATA SCIENCE WITH R-
PROGRAMMING**

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
<ol style="list-style-type: none"> 1. Exposure to theory as well as practical knowledge through R used in data analytics. 2. Fundamental basics of statistics used in analyzing the data 3. How to find the pattern in the given dataset 4. How to interpret the data graphically 5. How to apply different types of algorithms for the given dataset 		
SYLLABUS		
UNIT I:		
Introduction to Data analytics: Overview of Bigdata, Need of Data Analytics, Applications of Data Analytics, Datasets, tools for data analytics Basic Statistics: Mean, Median, mode, Standard Deviation, Variance, Correlation. Distribution: normal, binomial.		
UNIT II:		
Basic Analysis Techniques: Chi-Square Test, t-Test. Data Analysis Techniques: Linear and Logistic Regression. Introduction to R: R overview and history, Basic features of R, Installing R, packages in R, Getting started: Window section of RStudio, first interaction, command line versus scripts, comments. Variables in R: Naming variables, assigning values to variables, finding variables, removing variables, operators. R Data Structures: Vectors, Character Strings, Matrices, Lists, Data Frames, and Classes.		
UNIT III:		
Input of Data: input of data from terminal, input of data through R-objects. Output functions: print () function, cat () function. In-Built functions in R: Mathematical functions, String functions. User defined functions – function without arguments, function with arguments. Decision making structure: simple if statement, if-else statement, switch statement. Loops: while loop, for loop, Repeat loop.		
UNIT IV:		



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Data Types of R		
<p>Vectors: class of a vector, Elements of a vector, accessing vector elements, functions for vectors, obtaining the Length of a Vector. Common vector operations: Arithmetic & logical operations, Vector Indexing, using all () and any () functions, Vectorized operations, NA and NULL values.</p> <p>Matrices: creating a matrix, accessing matrix elements, functions for matrices, matrix indexing, filtering on matrices. Arrays: creating an array, accessing elements of an array, functions for array.</p>		
UNIT V:		
<p>Lists: creating a list, accessing list elements, functions for list, General list operations, list indexing, adding and deleting list elements.</p> <p>Import and Export of data: Import and export of data in excel file:reading from excel format, write to excel format.</p> <p>Data Visualization techniques: Introduction, pie chart, bar chart, scatter and box plots.</p>		
Outcomes:		
<ol style="list-style-type: none"> 1. Data-Visualization tools and techniques offer executives and other knowledge workers new approaches 2. Data visualization is a general term that describes any effort to help people understand the significance of data by placing it in a visual context. 3. Patterns, trends and correlations that might go undetected in text-based data can be exposed and recognized easier with data visualization software. 4. It isn't just the attraction of the huge range of statistical analyses afforded by R that attracts data people to R. The language has also developed a rich ecosystem of charts, plots and visualizations over the years. 		
Text Books:		
<ol style="list-style-type: none"> 2. Data Analytics with R, WILEY Publishing, Dr.Bharti Motwani. 3. The Art of R Programming by Norman Matlof, No starch press, SAN FRANCISCO,2011. 4. Data Analytics using R, McGrawHill Publications, Seema Acharya 		
References:		
<ol style="list-style-type: none"> 2. Rumset D. J. (2010): Statistical Essentials for Dummies. Hoboken: Wiley Publishing 3. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data by Hadley Wickham, O'Reilly 		



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B.C.A-Semester IV

INTRODUCTION TO DATA SCIENCE WITH R-
PROGRAMMING
LAB

Credits: 1	Theory: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:

1. Exposure to theory as well as practical knowledge through R used in data analytics.
2. Fundamental basics of statistics used in analyzing the data
3. How to find the pattern in the given dataset
4. How to interpret the data graphically
5. How to apply different types of algorithms for the given dataset

SYLLABUS

1. Write a program in R. To compute the product of two values
2. Write a program in R. to check whether the given number is even or odd.
3. Write a program in R. Sum of natural numbers.
4. Write a program in R. Find the factorial.
5. Exporting data to Excel, Text File
6. Mean, Median, Standard Deviation, Variance, Correlation in R
7. Correlation in R: Pearson & Spearman with Matrix Example
8. T Test in R
9. Chi-Square Test in R
10. Prediction using linear regression and visualizing the regression graphically
11. Prediction using logistic regression and visualizing the regression graphically
12. Bar chart in R

Outcomes:

1. Learn R programming language with simple example.
2. Ability to write different programs in R.
3. Familiar to apply statistical methods in R.
4. Analyze various tests in R .



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B.C.A. DATA SCIENCE -Semester IV

OBJECT ORIENTED SOFTWARE ENGINEERING

Credits: 4	Theory: 4 Hours	Tutorials: -
Max Marks: 100	External: 60 Marks	Internal: 40 Marks

Course Objectives:		
1. Illustrate basic taxonomy and terminology of the software engineering.		
2. Plan and monitor the control aspects of project.		
SYLLABUS		
UNIT I:		
The Scope of Object Oriented Software Engineering: Historical Aspects, Economic Aspects, Maintenance Aspects, Requirements, analysis and design aspects, the object oriented Paradigm, Terminology, Ethical Issues.		
Software Life Cycle Models: Software Development In Theory, Risks and other aspects of Iteration and Incrementation, Managing Iteration and Incrementation, other Life Cycle Models: Code and Fix, Waterfall, Rapid Prototyping, Open Source, Agile Processes, Synchronize and Stabilize, Spiral Models, Comparison of Life Cycle Models.		
UNIT II:		
The Software Process : The Unified Process, Iteration and Incrementation, The Requirements Workflow, The Analysis workflow, The Design Workflow ,The Implementation workflow, the test workflow, Post Delivery Maintenance, Retirement, the phases of the unified process, one-versus two-dimensional life cycle models, improving the software process, capability maturity models, costs and benefits of software process improvement.		



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UNIT III:		
<p>Models to Objects: What is a module? Cohesion, Coupling, Data Encapsulation, Abstract Data Types, Information Hiding, Objects, Inheritance, Polymorphism and Dynamic Binding, The Object-Oriented Paradigm.</p> <p>Reusability and Portability: Objects and Reuse, Reuse during design and implementation reuse and post-delivery maintenance, portability, techniques for achieving portability.</p> <p>Planning and Estimating: planning and the software process, Estimating duration and cost.</p>		
UNIT IV:		
<p>The Requirements workflow: Determining what client needs , overview of the requirements, understanding the domain, the business model, initial requirements, rapid prototyping , human factors, reusing the rapid prototype, metrics for the requirement workflow.</p> <p>The Analysis Workflow: the analysis workflow, extracting the entity classes.</p> <p>The Design Workflow: Object –Oriented Design, the design workflow, formal techniques for detailed design, real time design techniques.</p>		
UNIT V:		
<p>The implementation workflow: choice of programming languages, good programming practice, coding standards, code reuse, integration, the implementation workflow.</p> <p>Testing: Quality Issues, Non – Execution based testing, execution based testing, what should be tested?, testing versus correctness proofs. Test case selection, Black Box Unit Testing techniques, Glass-Box Unit Testing Techniques.</p>		
Outcomes:		
<ol style="list-style-type: none"> 1. Explore the basic concepts of software engineering. 2. Choose appropriate life cycle model for a project. 3. Implement the phases of the traditional software development process. 4. Design various test cases for a software product. 5. Analyze different architectural views. 		
Text Books:		
Stephen R.Schach -Object Oriented Software Engineering McGraw		Hill Higher Education
References:		
Timothy C.Lethbridge, Robert Language Object Oriented Software Engineering		



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Department of Computer Applications

B.C.A. DATA SCIENCE -Semester IV

OBJECT ORIENTED SOFTWARE ENGINEERING LAB

Credits: 1	Theory: 2 Hours	Tutorials: -
Max Marks: 50	External: 50 Marks	Internal:

Course Objectives:		
1. Illustrate basic taxonomy and terminology of the software engineering. 2. Plan and monitor the control aspects of project.		
SYLLABUS		
1	Online Examination System.	
2	Online Railway Reservation.	
3	Library Maintenance System.	
4	Any E-Commerce Portal.	
5	Biometric Attendance System.	
Outcomes:		
1. Understand the basic concepts of software engineering. 2. Applied appropriate life cycle model for a project. 3. Implement the phases of the traditional software development process. 4. Design various test cases for a software product. 5. Analyze different architectural views.		



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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.C.A. DATA SCIENCE
Second Year – III Semester (A.Y.2023-2024)
Paper Title: Object Oriented Programming Through Java
MODEL PAPER

Time: 3 Hours

Max. Marks: 60

PART - A

Answer ALL Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Explain about Features of Java.
(OR)
(B) Write about Java program structure with example.
2. (A) Explain Iterative control statements in Java with examples.
(OR)
(B) Explain Constructors, Method overloading with examples.
3. (A) What is an Array? How to create an Array in Java? Explain.
(OR)
(B) Define Inheritance. Explain Types of inheritance in Java.
4. (A) Explain Interfaces in Java with examples.
(OR)
(B) Write about Exception handling in Java.
5. (A) How to create Threads in Java?
(OR)
(B) Explain about the Applet Life cycle in Java.

PART - B

Answer any FIVE of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. Write short notes on Java Virtual Machine (JVM).
7. Discuss briefly about Data Types in Java.
8. How to create objects in Java?
9. Write short notes on switch statement.
10. Discuss briefly about Strings in Java.



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11. Write about Overriding methods.
12. What is an exception?
13. Write short notes on Packages in Java.

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B.C.A. DATA SCIENCE
Second Year – III Semester (A.Y.2023-2024)
Paper Title: Operating Systems
MODEL PAPER**

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Define Operating System. Explain Evolution of Operating Systems.
(OR)
(B) What is system calls in OS? Explain in detail with its types.
2. (A) Explain FCFS, SJF scheduling algorithms with example.
(OR)
(B) Explain Round Robin scheduling algorithm with example.
3. (A) Explain File System, file attributes, File Access methods.
(OR)
(B) Explain Directory Structure, Mass Storage Structure.
4. (A) Explain Dead lock system model.
(OR)
(B) Discuss Methods for Handling Deadlocks.
5. (A) Explain Logical & physical Address Space, Swapping.



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(OR)

(B) Explain Paging, Structure of Page Table. Segmentation.

PART – B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. What are the functions of Operating System?
7. Discuss about OS Structure.
8. What is a process? Explain different process states.
9. Explain Process Scheduling briefly.
10. Discuss File Sharing, Protection.
11. Write about Disk Structure.
12. Write about Deadlock Prevention.
13. What is Paging?



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B.C.A. DATA SCIENCE
Second Year – III Semester (A.Y.2023-2024)
Paper Title: Advanced Excel
MODEL PAPER**

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Explain basic spreadsheet concepts- Various selection techniques in Excel.

(OR)

(B) Discuss basic Functions in Excel with examples.

2. (A) Explain Mathematical Functions in Excel with examples.

(OR)

(B) Explain Date and Time Functions Functions in Excel with examples.

3. (A) Explain Data Tables (PMT Function) - Solver Tool in Excel.

(OR)

(B) Explain Data Validation in detail with examples.

4. (A) Write about Lookup Functions in Excel.

(OR)

(B) Explain Pivot Tables in detail with examples.

5. (A) Explain types of Charts in Excel.

(OR)

(B) Explain Excel Dashboard.

PART - B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. Discuss Shortcut Keys in Excel.

7. Explain features of Excel.

8. Write about Formulas in Excel.

9. Explain Paste Formats- Paste Validations.

10. Discuss Number, Date & Time Validation.

11. Write about Text and List Validation.

12. Write short notes on Filtering PivotTables.

13. Write short notes Using Slicers, Filter data with Slicers.



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B.C.A. DATA SCIENCE
Second Year – IV Semester (A.Y.2023-2024)**

Paper Title: TABLUE

MODEL PAPER

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Explain Architecture, features of Tablue.

(OR)

(B) Write about Data Terminology, Data file formats, design flow, file types, data types

2. (A) Explain Data visualization.

(OR)

(B) Write about Formatting Tools and Menus, Formatting specific parts of the view.

3. (A) Write about Tableau Calculations.

(OR)

(B) Explain Tableau Data Sources in detail.

4. (A) Explain about Manipulating Data in Tableau.

(OR)

(B) Write about Applying Filters, context Filters, condition Filters, Quick Filters.

5. (A) Explain Tableau file types, publishing to Tableau Online.

(OR)

(B) Write about Pivot table and Heat Map, Highlight Table, Bar Chart, Line Chart, Area Chart.

PART - B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. Explain File Types & Extensions, Tools of Tablue

7. Discuss Tableau Products.

8. Explain Connecting your Data to Tableau.

9. Discuss Editing and Formatting Axes.

10. Write about SUM, AVR, and Aggregate features.

11. Discuss Data joining, Data blending.

12. Explain context Filters, condition Filters.

13. Discuss Histogram.



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B.C.A. DATA SCIENCE
Second Year – IV Semester (A.Y.2023-2024)
Paper Title: DATA MINING AND DATA WARE HOUSING
MODEL PAPER**

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Explain Data Mining Functionalities. What Kinds of Patterns Can Be Mined?

(OR)

(B) Explain Data Preprocessing.

2. (A) Explain Schemas for Multidimensional databases.

(OR)

(B) Write about Data Warehouse Architecture.

3. (A) Explain Apriori Algorithm with example.

(OR)

(B) Discuss Generating Association Rules from Frequent Item sets.

4. (A) Write about Classification by Decision Tree Induction.

(OR)

(B) Explain Rule-Based Classification: Using IF-THEN Rules for Classification.

5. (A) Discuss Types of Data in Cluster Analysis.

(OR)

(B) Explain Agglomerative and Divisive Hierarchical Clustering

PART - B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. What Is Data Mining?
7. Explain Data Mining Functionalities
8. What is a Data Warehouse?
9. What is Classification?
10. What is Prediction?
11. Discuss Attribute Selection Measures.
12. What is Cluster Analysis?
13. Discuss Divisive Hierarchical Clustering.



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B.C.A. DATA SCIENCE
Second Year – IV Semester (A.Y.2023-2024)
Paper Title: WEB PROGRAMMING
MODEL PAPER**

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) What are the Advantages & disadvantages of Internet?

(OR)

(B) Define of e-mail. What are the advantages & disadvantages of e-mail?

2. (A) Explain Text formatting tags with examples.

(OR)

(B) Explain types of lists in html.

3. (A) Explain Frames in html.

(OR)

(B) Discuss Form Controls with examples.

4. (A) Explain operators in Javascript.

(OR)

(B) Discuss conditional control statements in Javascript.

5. (A) Explain Defined Functions - Function Definitions - Scope Rules - JavaScript Global Functions.

(OR)

(B) Explain Cascading Style Sheets (CSS).

PART – B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. Define WWW, WWW tools

7. Discuss message components of e mail.

8. Discuss HTML document structure.

9. Explain anchor tag in html.

10. Discuss table creations tags in html.

11. Write about variables.

12. Explain while, do...while loops

13. Discuss properties related to Fonts.



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B.C.A. DATA SCIENCE
Second Year – IV Semester (A.Y.2023-2024)**

Paper Title: DESIGN AND ANALYSIS OF ALGORITHMS

MODEL PAPER

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Explain pseudo code for insertion sort and analysis of time complexity.
(OR)
(B) Explain Asymptotic Notations in detail.
2. (A) Explain Quick sort and Derivation of Average case analysis and Worst-case analysis.
(OR)
(B) Explain Binary Search and Derivation of Average case analysis.
3. (A) Write about minimum cost spanning trees.
(OR)
(B) Explain Kruskal's and Prim's Algorithms.
4. (A) Explain Traveling salesman problem.
(OR)
(B) Explain optimal parameterization for product of sequence of matrices and multistage graphs.
5. (A) Explain 4-Queens, Sum of Subsets.
(OR)
(B) Explain Random Number Generators and Primality Testing using randomized algorithms.

PART - B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. Discuss Space complexity and Time complexity.
7. Write pseudo code for insertion sort.
8. Discuss Divide and Conquer Algorithms.
9. Explain Strassen's Matrix Multiplication.
10. Discuss Fractional Knapsack problem.
11. Explain Optimal Merge patterns.
12. Write about All-pairs shortest paths.
13. What is backtracking?



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Second Year – IV Semester (A.Y.2023-2024)**

**Paper Title: INTRODUCTION TO DATA SCIENCE WITH R-
PROGRAMMING**

MODEL PAPER

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Explain Need of Data Analytics, Applications of Data Analytics.
(OR)
(B) Discuss about Mean, Median, mode, Standard Deviation, Variance and Correlation.
2. (A) Explain Data Analysis Techniques.
(OR)
(B) Discuss R Data Structures: Vectors, Character Strings, Matrices, Lists, Data Frames & Classes.
3. (A) Explain Mathematical functions, String functions.
(OR)
(B) Discuss while loop, for loop, Repeat loop with examples.
4. (A) Explain Vectors in R with examples.
(OR)
(B) Explain Matrices in R with examples.
5. (A) Explain Lists in R with examples.
(OR)
(B) Explain Data Visualization techniques.

PART – B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. Explain Bigdata.
7. Discuss Datasets, tools for data analytics.
8. Explain Chi-Square Test, t-Test.
9. Discuss Variables in R.
10. Write about print () function, cat () function.
11. Discuss switch statement.
12. Write short notes on Arrays.
13. How to Import and export of data in excel file.



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B.C.A. DATA SCIENCE
Second Year – IV Semester (A.Y.2023-2024)
Paper Title: OBJECT ORIENTED SOFTWARE ENGINEERING**

MODEL PAPER

Time: 3 Hours

Max. Marks: 60

PART - A

Answer **ALL** Questions

5 x 8 = 40 Marks

Draw labeled diagrams wherever necessary

1. (A) Explain Requirements, analysis and design aspects, the object oriented Paradigm.
(OR)
(B) Discuss Life Cycle Models: Code and Fix, Waterfall.
2. (A) Explain the Unified Process, Iteration and Incrementation.
(OR)
(B) Discuss the phases of the unified process, one-versus two-dimensional life cycle models
3. (A) Explain Reusability and Portability.
(OR)
(B) Discuss The Object-Oriented Paradigm.
4. (A) Explain the Requirements workflow.
(OR)
(B) Discuss The Design Workflow.
5. (A) Explain The implementation workflow.
(OR)
(B) Discuss Black Box Unit Testing techniques, Glass-Box Unit Testing Techniques.

PART - B

Answer any **FIVE** of the following:

5 x 4 = 20 Marks

Draw labeled diagrams wherever necessary

6. Explain Economic Aspects, Maintenance Aspects.
7. Discuss Rapid Prototyping model.
8. Write about improving the software process, capability maturity models.
9. Discuss costs and benefits of software process improvement.
10. What is inheritance?
11. Explain Information Hiding, Objects.
12. Discuss extracting the entity classes.
13. Write about testing versus correctness proofs.



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